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Geomorphic response to historic drought in northern California

Georgina Bennett (1,2,3), Joshua Roering (1), Ben Mackey (1,4), Alexander Handwerger (1), Benoit Guillod (5), and David Schmidt (6)

(1) Department of Geological Sciences, University of Oregon, USA, (2) Department of Geosciences, Colorado State University, USA, (3) US Forest Service Rocky Mountain Research Station, USA, (4) Department of Geological Sciences, University of Canterbury, New Zealand, (5) Environmental Change Institute, University of Oxford, United Kingdom, (6) Department of Earth and Space Sciences, University of Washington, USA

California declared a state of drought emergency in early 2014 with a recent study showing that 2012 – 2015 constitutes a drought unprecedented in the state's historical record. Much has been reported on the drought's devastating impacts on water supply, agriculture and wildfire occurrence as well as its possible origins, including the role of anthropogenic climate change. However, its geomorphic impact has been given little attention. We address this gap by assessing the response of earthflows to drought in the Eel River in northern California. Despite their slow-moving nature, earthflows contribute ∼50% of erosion in the region and are a constant threat to transport routes, making their behavior important to understand. We used pixel tracking in the program COSI CORR to measure velocities of 98 earthflows for the periods 2009 – 2012 and 2012 – 2015 from 0.5 m resolution Worldview satellite imagery. Putting these measurements in the context of velocities manually measured from aerial photographs dating back to the 1950s indicates that whilst earthflows have decelerated significantly in the ensuing drought this is part of a slowing trend commencing around 2000. We show that decadal earthflow velocities are closely correlated with the Palmer Drought Severity Index (PDSI), which in turn is correlated with North American Land Data Assimilation System (NLDAS)-modeled soil moisture. Slowing of earthflows since 2000 is coincident with a reduction of soil moisture, starting with the 2000 – 2001 drought from which earthflows have not yet returned to their pre-drought values and which set the stage for the slowest mean velocities observed in recent decades during the current drought. It will be important to continue to monitor these earthflows as rains return, particularly given the hypothesis that extreme drying may increase pathways for future runoff into earthflows.